1. Is the laser workstation class 1 or class 4 enclosure?

The existing laser is a class 4 workstation. The workstation has a protective enclosure that makes it class 1. The ablation system needs to fit inside the enclosure and, by using beam steering, allow the same laser to be used for its current use for mask illumination.

2. In other words, do we need an enclosed beam delivery unit with a cover interlock, preventing accidental exposure to UV light?

No.

3. Do you require nitrogen purging in the optical beam path? Typically 193nm laser processes requiring purging to maximize transmission (caused by ozone formation).

No. Nitrogen purging is not required.

4. What is the z axis travel? Is 25mm (1 inch) suitable?

Travel of at least 1-inch is required for the Z-axis stage. The stages need to be software controlled with motion coordinated with the laser pulses and have at least 0.5 um resolution and 2.0 um repeatability.

5. Goniometer axis: What is the angular range? Is +/- 45 degrees acceptable? This is a "cradle" type goniometer. Alternatively a rotary stage goniometer can be employed without angular range limitations.

Angular travel of at least 20 degrees is required for the goniometer (+/- 45 degrees is acceptable). Either a cradle or rotary type goniometer would be acceptable.

6. Can you please verify that you require 10 arc-second accuracy? We believe the specification is 10 arc second resolution.

The goniometer needs to have at least +/- 10 arc-second accuracy (or resolution) and +/- 0.5 arc-second repeatability. (Repeatability is the ability to return to the same position. Accuracy is how close the actual positioning is to the desired position).

7. Regarding dxf programming, is this dxf programming for 2-D devices or 3-D devices?

3-D.

8. What is the xy stage speed requirements? Is 25 to 50 mm/sec satisfactory?

Yes, 25 to 50 mm/sec is satisfactory as a <u>maximum</u> speed (a minimum speed would be discrete steps at the highest resolution). The stage movement and laser ablation need to be controlled and coordinated by software. The software portion of the system would automatically control the positioning of the sample and the laser ablation, without any user intervention while the stage is in motion.

9. Do you prefer a stand alone workstation enclosure or a table top workstation?

A table top workstation is required. The workstation must fit in the present workstation tabletop enclosure and allow other ongoing experiments to be performed, as mentioned in specification 2.

10. Specification 3 states, "10-15x objective". We are familiar with conventions to specify the laser objective lens that include items like spot size, working distance and depth of field. We are familiar with the convention you use as a means of specifying the magnification for the CCTV viewing system. Are you referring to the viewing system magnification or to some requirement for the laser objective?

Specification 3 states that it the 10-15x objective is part of the UV beam delivery, however the viewing should be coaxial with the UV objective (thru-the-lens).

11. Do you want to aperture the laser to provide a round spot, or do you want the optics to deliver the full beam? If an aperture is desired, what aperture size do you want?

Aperture the laser beam. Aperture size and shape will depend on the application and should be adjustable. Spot sizes less than or equal to 10 microns should be attainable.

12. You specify monochromatic illumination in specification 4. Can you help us understand why 650 nm illumination is required?

650 nm illumination provides enhanced resolution.

13. Is it your intention to deliver the laser for integration with the system at the contractor's site?

The laser will remain at the NRL facility. Prospective offerors are reminded of the requirement to install the micromachining system at NRL, Washington, D.C.

14. Does the system need to be a class one system? (Class one is fully enclosed and interlocked). Or is a Class four system acceptable? (Class four would have an open laser beam only in a small region from the focusing lens to the part to be processed).

See question 1.

15. What is meant by "maintain the option for current use for mask illumination". Exactly what are the mask sizes and shapes and the illumination optics in the current configuration? What are the optics and what are the distances from the laser to the mask?

The ablation system needs to fit inside the present enclosure (47"x36"x24") which is situated on a table in front of the excimer laser. The laser beam is parallel to the long dimension of the enclosure and enters in the middle of the 24 x 36" side. This enclosure is also used for a project unrelated to this laser ablation system, which will occupy about a cubic foot of volume within the enclosure. Presently, there is a beam homogenizer in the path of the laser beam that will be used for both projects. By using beam steering, the laser beam can be directed to either the laser ablation system or the mask illumination experiments. The stage movement and laser ablation need to be controlled and coordinated by software.

The mask size is 3x3 inch square. The optics for the existing mask illumination include the beam homogenizer and a focusing lens. The distance from the laser to the mask is not critical, so long as it all fits in the enclosure.

16. What is the part size, shape and weight to be processed?

Substrates will be 1 to 5" in any dimension. Features can be as small as 10 microns. Substrate shapes can be variable. Weight will likely be less than 0.25 kg.

17. Explain the process that will require the goniometer. How will the goniometer stage be used to process parts? Are there any typical part drawings available to see how this process will work? If so please send them. Is a rotary stage at 90 degrees with an appropriate angle bracket acceptable?

The goniometer will be used to turn the part in order to ablate regions at different angles. There are no drawings at present. Either a cradle or rotary type goniometer orientable up to 90 degrees would be acceptable, so long as the stage doesn't block the laser beam from reaching the sample. Also, see question 5.

18. Does the existing laser have an RS-232 interface? What is the manufacture year of the laser? What user interface does it currently have? Is it a Nova tube laser?

The existing Lambda Physik LPX 210 Excimer laser (manufacture year 1995) has a trigger control that is connected to a dedicated computer. It is not clear whether the present laser control software will be compatible with other external control software. A dedicated laser control program may need to be written that uses the laser interface card. The laser apparently has no RS-232 interface on it, but one could be added to the control computer. We do not know if it is a Nova tube laser.

19. Please explain the feature sizes and resolution required and in what type of plastic.

The actual feature sizes are yet to be determined, but will be between 10-1000 microns. Some parts will be 20-100 micron chambers with 5-20 micron holes in them. A variety of plastics types will be used, including polymethylmethacrylate (PMMA) and polystyrene.

20. What is the acceptance criteria for the part feature generation?

Reproducible production of 10 micron features/holes.

THE DUE DATE FOR THE RECEIPT OF PROPOSALS REMAINS FEBRUARY 27, 2003 AT 4:00 P.M. ALL OTHER TERMS AND CONDITIONS REMAIN UNCHANGED.